PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project	
Ford Hatchery Improvement, Operation and Maintenance	
BPA project number	**20096**
Contract renewal date (mm/yyyy)	
Multiple actions? (indicate Yes or No)	
Business name of agency, institution or organization requesting funding	
Washington Department of Fish and Wildlife	
Business acronym (if appropriate)	**WDFW**
Proposal contact person or principal investigator:	
Name	**Mike Lewis, Complex Manager**
Mailing address	**Spokane Hatchery, 2927 West Waikiki Road**
City, ST Zip	**Spokane, Washington 99208**
Phone	**(509) 625-5169**
Fax	**(509) 625-5170**
Email address	**none**
NPPC Program Measure Number(s) which this project addresses	
September 15, 1995 Fish and Wildlife Program Measure 10.8B.24.	
FWS/NMFS Biological Opinion Number(s) which this project addresses	
Not applicable	
Other planning document references	
(1) Upper Columbia River Blocked Area Management Plan (i.e. Regional Plan Developed for Integrated Framework); (2) Columbia Basin Fish and Wildlife Authority (CBFWA) 1997 Multiyear Implementation Plan: (3) NPPC September 13, 1995 FWP, Measures 10.8B to 10.8B.26 (pp. 10-30 to 10-47), Action Plan above Chief Joseph/Grand Coulee Dams. Includes biological objectives, strategies for achieving them and specific implementation measures. Also, Findings (Section 16) need to be reviewed. (4) WDFW Region 1 water management plans (fisheries) for lowland lakes.	
Short description	
Improve water supply and hatchery building, operate and maintain Ford Hatchery to enhance the recreational and subsistence kokanee fishery in Lake Roosevelt and Banks Lake, and bolster put-and-take resident trout fishing lakes in Region 1 (Eastern WA).	
Target species	
Kokanee salmon, resident trout.	

Section 2. Sorting and evaluation

Subbasin
Upper Columbia - Spokane, Pend Oreille (WA), Upper Columbia Mainstem.

Evaluation Process Sort

CBFWA caucus		**CBFWA eval. process**		**ISRP project type**	
X one or more caucus		If your project fits either of these processes, X one or both		X one or more categories	
	Anadromous fish	X	Multi-year (milestone-based evaluation)		Watershed councils/model watersheds
X	Resident Fish		Watershed project eval.		Information dissemination
	Wildlife			X	Operation & maintenance
				X	New construction
					Research & monitoring
					Implementation & mgmt
					Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	**Project title/description**

Other dependent or critically-related projects

Project #	**Project title/description**	**Nature of relationship**
9104600	Spokane Tribal Hatchery O & M (FWP Measure 10.8b.2)	Operated in conjunction with Sherman Creek Hatchery; serves as the primary egg incubation and rearing facility for the Lake Roosevelt kokanee and rainbow trout program. Ford Hatchery production will augment this program.
9104700	Sherman Creek Hatchery O & M (FWP Measure 10.8B.2)	Operated in conjunction with Spokane Tribal Hatchery; serves as kokanee egg

		collection site and kokanee and rainbow trout fingerling/yearling rearing and acclimation facility. Ford Hatchery production will augment this project.
9500900	Lake Roosevelt Rainbow Trout Net Pens (FWP Measure 10.8B.11	Net Pens rear 500,000 rainbow trout fingerlings raised at Spokane Tribal & Sherman Creek Hatcheries. Released into Lake Roosevelt after annual spring drawdown.
5228100	Lake Roosevelt Kokanee Net Pens (FWP Measure 10.8B	Net Pen rears 500,000 kokanee fingerling transferred from Spokane Tribal Hatchery for release into Lake Roosevelt after annual spring drawdown. Ford Hatchery production will augment this project.
9001800	Habitat Improvement - Lake Roosevelt (FWP Measures 10.8B.9 and 10.8B.10)	Habitat improvement in Lake Roosevelt tributaries for rainbow trout juvenile rearing and adult passage to increase natural production.
9404300	Lake Roosevelt Monitoring/Data Collection Program (FWP Measure 10.8B.5	Monitors and evaluates hatchery stocking program harvest goals; effects of hatchery on Lake Roosevelt biota; collects fisheries and limnological data for reservoir modeling. Will evaluate Ford Hatchery stocking in Lake Roosevelt.
950110	Grand Coulee Kokanee Enhancement Project (FWP Measure 10.8B.7 and 10.8B.8)	Monitors fish entrainment through Grand Coulee Dam and evaluates natural reproduction of wild kokanee stocks in Lake Roosevelt.
	Lake Roosevelt Hatcheries Coordination Team (FWP Measure 10.8B.2)	Fishery managers from above projects meet quarterly for review projects and coordination/information sharing.
9700400	Joint Stock Assessment (JSA) (FWP Measure 10.8B.26)	Information exchange/blocked area coordination. Creel data collection at Banks Lake to evaluate Ford Hatchery kokanee stocking will improve data for JSA.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
	Not applicable (new project).	

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Improve water supply and hatchery building at Ford Hatchery to restore 35,000 lb. of kokanee and resident trout production by increasing production from 58,000 to 93,000 lb. annually.	a	Conduct engineering and design to restore and improve Ford Hatchery water supply and remodel Ford Hatchery building, including demolition of the old shell and reconstruction using better building materials (e. g., metal roof to replace old wood one)
		b	Conduct NEPA and determine permit requirements.
		c	Obtain required permits.
		d	Rebuilding of groundwater infiltration system, including enclosure of water that currently flows through open trenches and installation of subteranian tiles at production springs to collect more water by stopping seepage into the ground.
		e	Demolish old hatchery building shell and replace it with a new one with metal roof.
2	Operate and maintain Ford Hatchery to produce 93,000 lb. of kokanee and resident trout annually for stocking into Lake Roosevelt, Banks Lake and other put-and-take trout fishing lakes in northeastern Washington.	a	Develop Memorandum of Agreement between BPA and WDFW to partially fund operation and maintenance of Ford Hatchery for a period of 10 years.
		b	Incubate, hatch and rear 1.5 million kokanee at 200/lb. and 250,000 at 80/lb. for stocking respectively into Banks Lake and Banks Lake net pens (10,625 lb.).
		c	Incubate, hatch and rear 250,000 kokanee at 80/lb. for transfer into Lake Roosevelt net pens (3,125 lb.).
		d	Incubate, hatch and rear approximately 500,000 to 1,000,000 resident trout

Obj 1,2,3	Objective	Task a,b,c	Task
			(79,250 lb.) for stocking into put-and-take trout fishing lakes in eastern Washington.
		e	Transfer and release 10,625 lb. of kokanee into Banks Lake and Banks Lake net pens.
		f	Transfer and release 3,125 lb. of kokanee into Lake Roosevelt net pens.
		g	transfer and release 79,250 lb. of resident trout into put-and-take trout fishing lakes in eastern Washington.
		h	Fin clip kokanee before release into Banks Lake or Lake Roosevelt.
		i	Monitor fish health at Ford Hatchery.
		j	Record keeping and communication. Maintain records on hatching success, food conversion, planting and disease problems. Write Annual Operation Plan that defines Annual Production Goals (APG) to BPA.
		k	Write annual report to BPA that describes attainment of APG and assesses effectiveness in terms of creel harvest (see objective 3 and 4 for details).
3	Coordinate Ford Hatchery operations with those at Sherman Creek and Spokane Tribal Hatchery to meet regional production goals for kokanee at Lake Roosevelt and Banks Lake.	a	Attend quarterly meetings of Interagency Lake Roosevelt Hatchery Coordination Team
4	Monitor and evaluate improvements in the kokanee fishery at Lake Roosevelt and resident trout fishery in inland put-and-take trout lakes resulting from Ford Hatchery stocking.	a	Lake Roosevelt Monitoring Program will monitor harvest rates and return to stocking sites of kokanee transferred to Lake Roosevelt net pens. (No additional cost to BPA.)
		b	WDFW will conduct creel and fisheries surveys at inland lakes as part of routine monitoring of these lakes. (No additional cost to BPA.)
5	Monitor and evaluate improvements in the kokanee fishery at Banks	a	Design a stratified (weekdays, weekend/holidays) random sampling

Obj 1,2,3	Objective	Task a,b,c	Task
	Lake resulting from Ford Hatchery stocking by conducting creel surveys year-round because anglers can fish Banks Lake year-round.		creel survey for Banks Lake. Conduct surveys on 8 weekdays and 4 weekend/holidays per month.
		b	Make replicate pressure counts by automobile to count boat trailers and shoreline anglers to estimate mean fishing pressure and variance (to calculate 95% confidence intervals) for each type of angler.
		c	Confirm automobile pressure counts by making air flights twice each quarter
		d	Conduct angler interviews to determine lengths of completed trip, catch and harvest of individual species, catch per unit effort (CPUE), and harvest per unit effort (HPUE) by species, and individual fish data (length, weight, and fin clip).
		e	Tabulate and expand creel data to estimate monthly and annual total catch and total harvest (+ or - 95% confidence intervals) of the stocked kokanee and other species.
		f	Use expanded creel data to estimate the number of annual angler trips and economic value of the fishery.
		g	Write annual report that summarizes total angler pressure, CPUE, HPUE, total catch, total harvest and economic value of the fishery. Submit to Ford Hatchery for inclusion in BPA Annual Report.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	10/1999	9/2002	Ford Hatchery water supply and plant improved to raise 93,000 lb. of kokanee and resident trout.	Engineering design and NEPA completed by 9/2000. Water supply improved	59.70%

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
				by 9/2001. Hatchery building reconstructed by 2002.	
2	10/1999	9/2010	Final production of 93,000 lb. of kokanee and resident trout per year from 2002-2010 released into Lake Roosevelt, Banks Lake and inland trout lakes in eastern Washington. Includes 250,000 fin clipped kokanee for Banks Lake and 250,000 for Lake Roosevelt.	Initial production goal of 72,000 lb. of kokanee (500,000 fin clipped) and resident trout per year in 2000 and 2001 until water supply improvement is attained.	27.60%
3	10/1999	9/2010	Ford Hatchery production destined for Lake Roosevelt and Banks Lake coordinated with Sherman Creek and Spokane Tribal Hatchery.	Quarterly attendance at Lake Roosevelt Hatchery Coordination Team; coordination reflected in annual operating plans for each hatchery.	0.50%
4	10/1999	9/2004	Ford Hatchery contribution to kokanee harvest and spawning escapement in Lake Roosevelt determined. Lake Roosevelt harvest goal for all hatchery kokanee is 290,000, escapement goal is 10,000.	Current harvest ranges from 1,265 to 32,353 fish per year and is dependent upon reservoir operations. Increase above these numbers would indicate improvement.	0.00%
5	10/1999	9/2004	Ford Hatchery contribution to kokanee harvest in Banks Lake determined.	Annual reports	12.20%
				Total	100.00%

Schedule constraints Project requires NEPA permits. Hatchery already has water rights, is in compliance with SEPA concerning handling of fish waste from 93,000 lb. production.
Completion date September 2010.

Section 5. Budget

FY99 project budget (BPA obligated):	$**0**

FY2000 budget by line item

Item	Note	% of total	FY2000 ($)
Personnel	Includes: 1 FTE (fish culturist), 3 PTE @ 2 months (fin clippers) and 1 FTE (creel clerk)	19	63,570
Fringe benefits	WDFW Fringe rate @ 27.65% of salaries	5	17,545
Supplies, materials, non-expendable property	Includes fin clipper instruments and supplies for creel survey.		1,300
Operations & maintenance	Includes food to rear kokanee and fish health monitoring	5	16,437
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	None budgeted in FY 2000. Will commence in FY 2001		0
NEPA costs	Estimated by BPA (Patti Smith) via telephone conversation on 12-3-98	30	100,000
Construction-related support	Engineering/design to improve water supply, demolish old building and construct new shell.	25	82,808
PIT tags	# of tags:	0	0
Travel	Includes trips for outplanting kokanee, milage for creel clerk, and air flights for creel survey	5	15,334
Indirect costs	20% of budgeted items, less fish food and capital acquisition, and NEPA costs = 20% of $180,557.	11	36,111
Subcontractor			0
Other			0
		TOTAL BPA REQUESTED BUDGET	$333,105

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
WDFW Hatchery Division	Portion of Ford Hatchery personnel, O&M costs, and fish stocking costs associated with stocking resident trout into eastern Washington put-and-take trout lakes.	24	117,608
Banks Lake Volunteer Net Pen Program	Volunteer labor to set up net pens (5 people x 5 days x 8h/day x $10/h) = $2,000; check and feed fish daily for 8 mo. (240 days x 2h/day x $10/h) = $4,800	1	6,800
WDFW Aquatic Lands Enhancement Fund	Provide funds for feed to Banks Lake Volunteer Net Pen Program	2	9,600
WDFW Region 1 Fisheries Manager	Evaluate Ford Hatchery stocking in inland trout management lakes by conducting routine field surveys and fish surveys.	6	28,000
		Total project cost (including BPA portion)	$495,113

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$355,527	$814,247	$138,438	$140,237

Section 6. References

Watershed?	Reference
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PART II - NARRATIVE

Section 7. Abstract

This project is a resident fish substitution measure (10.8B.24) in the NPPC 1995 FWP to replace salmon losses related to construction of Grand Coulee Dam. The goal of this project is to improve the water supply and hatchery building, operate and maintain Ford Hatchery to enhance the recreational and subsistence kokanee fisheries in Lake Roosevelt and Banks Lake. The Ford Hatchery will augment production at Sherman Creek and Spokane Tribal kokanee/rainbow trout hatcheries by producing 10,626 lb. (1.75 million) kokanee for Banks Lake and 3,125 lb. (250,000) kokanee for Lake Roosevelt net pens. Also, Ford Hatchery will continue to produce resident trout (79,250 lb.) to promote the sport fisheries in put-and-take trout fishing lakes in eastern Washington (WDFW Management Region 1). Engineering design and NEPA permitting would commence in FY 2000, water supply improvements and hatchery remodel are scheduled for FY 2001 and FY 2002, respectively. Operation and maintenance funding would start in FY 2000 and continue through FY 2010. Monitoring and evaluation of the Ford Hatchery stocking program will involve three components: (1) Interfacing with the Lake Roosevelt Monitoring Program (BPA Project No. 9404300) to assess kokanee planting in Lake Roosevelt; (2) Utilizing existing WDFW creel and lake survey programs to assess resident trout planting in trout management waters: (3) Conducting a BPA funded creel survey to assess kokanee planting in Banks Lake.

Section 8. Project description

a. Technical and/or scientific background

This proposal seeks funds to make improvements to the water supply and hatchery building at an existing WDFW hatchery at Ford, Washington to rear 93,000 lb. of kokanee salmon and resident trout for stocking into Lake Roosevelt, Banks Lake and other inland lakes in northeastern Washington. Additionally, partial funding of operation and maintenance for this facility is sought from BPA. These measures will result in a net gain of 35,000 lb. of salmonid production over the 1990-1995 average production of 58,000 lb. produced at Ford Hatchery.

Ford Hatchery was constructed by the U.S. Bureau of Reclamation in 1941 to partially mitigate for resident fish losses caused by construction of Grand Coulee Dam (Calkins et al. 1939, Fish

and Hanavan 1948). The Ford Hatchery has currently been operating for 58 years without major renovations or improvements. The hatchery site is located on land leased to WDFW by the Bureau of Reclamation. The hatchery water supply is composed of natural springs that seep from the upper unit of the Chamokane Valley Aquifer System (Buchanan et al. 1988, Matt and Buchanan 1993). The Ford Hatchery water supply is a series of infiltration trenches that intercept water flowing out of several small springs and drains through ditches into collection ponds, which gravity feeds first the hatchery building, then through a series of outdoor ponds and raceways.

In 1989, the former Washington Department of Wildlife commissioned a statewide hatchery evaluation by Fish Pro Inc., (FishPro 1988, 1989). This study and subsequent investigations by WDFW engineers identified some correctable problems at Ford Hatchery, centered around declining fish production due to reduced water supply and quality. Historically (1966-1989), the facility produced an average 93,000 lb. of resident salmonids annually (FishPro 1989). From 1990-1995, average annual production declined to an average of 58,000 lb. of resident salmonids, i.e., 35,000 pounds of lost production. This decline in fish production correlated with reduction in water supply, which ranged from 4.1-9.1 CFS (average 7.5 CFS) from 1960 to 1989, compared to 2.2-5.3 CFS (average 4.5 CFS) from 1990 to 1995. Factors that could have potentially contributed to declining spring production included: Increased irrigation withdrawals that could have mined water from the Chamokane Valley Aquifer; Extended drought conditions during the late 1980s and early 1990s; Collapse of the hatchery's groundwater infiltration/collection system. Water quality problems were related primarily to increased siltation of the infiltration water.

It is unlikely that irrigation withdrawals were responsible for the declining spring production because an aquifer investigation by Buchanan et al. (1988) examined the influences of permitted irrigation withdrawals from the aquifer on the discharge of lower Chamokane Creek and found no discernable impact. The Ford Hatchery springs are the principle water source of Chamokane Creek.

Factors that contributed to decreased spring discharge were prolonged drought during the period from 1987 to 1993 and damage to the hatchery's groundwater collection system. Spring discharge decreased steadily during the drought to a low of 2.2 CFS in 1993. As precipitation increased to normal amounts from 1994 to 1998, the aquifer was recharged and spring discharge increased to a range of 2.8 to 7.1 CFS (average 5.9 CFS) but has not fully recovered to its historic level. Incomplete recovery appears to be related to the aging groundwater collection system. The system utilized open ditches and infiltration trenches to collect water. Over the years, erosion has widened and reduced the depth of the ditches, leading to problems with increased silt and increased evaporation.

WDFW engineers have evaluated the site and concluded that several options are available to gain the 2-3 CFS of additional water needed to return the facility to full production. Enclosure of the supply canals would reduce sedimentation and improve water quality delivered to the hatchery. Additionally, WDFW engineers believe that subterranean tiles could be installed in the springs to prevent seepage back into the ground and improve diversion of water into the infiltration trenches.

This was the basis of WDFW's recommendation to NPPC for improving the water supply to

regain 35,000 lb. of lost salmonid production. NPPC approved this recommendation as a measure (10.8B.24) that was included in the September 13, 1995 FWP. Prior to this, WDFW had consulted with the Bureau of Reclamation (BOR) on several occasions concerning the need for additional water at Ford Hatchery. In 1993, the BOR was prepared to fund this project with drought relief money when funds were diverted out of the region for disaster relief. At present, a BOR option for funding is no longer available because BOR, NMFS, USFWS, and COE developed an MOA, approved by Congress, that limits the annual federal fish and wildlife obligation of those agencies and directs that funding for such projects be coordinated through the BPA implementation process.

A second problem at Ford Hatchery is the shell of the 58-year old hatchery building. Both side walls and roof were constructed of wood, which has deteriorated owing to interior humidity and needs to be replaced. The concrete structures, including foundation and interior raceways, are still currently in good shape. Also, the water delivery system and incubation/rearing troughs are still serviceable. Hence, the primary renovation needed is replacement of the building shell. Here, we propose to demolish the old shell and replace it with a new one constructed of materials better able to withstand humidity associated with hatchery buildings (eg., a metal roof).

Another aspect of this proposal is that BPA provide funding to WDFW for a portion of the operation and maintenance of the Ford Hatchery. Ford Hatchery was originally a mitigation hatchery for resident fish losses caused by construction of Grand Coulee Dam. It was one of the four hatcheries constructed as part of the Grand Coulee Fish Maintenance Project, proposed by a Board of Consultants composed of fisheries scientists from Stanford University, under contract to the U.S. Bureau of Reclamation. In addition to Ford Hatchery, the plan called for relocating anadromous salmon permanently blocked by Grand Coulee offsite by (1) constructing three federal salmon hatcheries in the Wenatchee, Entiat and Methow Rivers, (2) intercepting fish bound for spawning sites above Grand Coulee as they passed through the fish ladder at Rock Island Dam from 1939-1944 and transferring them to the hatcheries where they were held in captivity until eggs could be collected, and (3) raising the progeny at the hatcheries until they could be stocked into the Wenatchee, Entiat, Methow and Okanogan drainages. The attempt failed because most of the trapped fish died before they could spawn and few eggs survived due to fungal infection (BOR 1941; Fish and Hanavan 1948), resulting in the exterpation of many of the stocks that formerly spawned above Grand Coulee (Koch 1976; Marshall et al. 1995). This resulted in conversion of all or part of the production at these facilities to resident trout during the 1950s and 1960s (Meekin 1974; Moos 1975). Subsequently, in the 1970s, efforts were made to restore the facilities to primarily anadromous salmonid production. Because the federal hatchery salmon program had struggled, non-local chinook salmon were brought in to augment hatchery production, resulting in chinook salmon of mixed ancestry (Marshall et al. 1995). Currently, the three federal hatcheries raise spring chinook that are primarily descendants of fish brought in during the 1970s from Carson Hatchery in the Wind River (Marshall et al. 1995). Carson fish originated by intercepting a conglomeration of Snake River, mid Columbia and upper Columbia spring chinook stocks at Bonneville Dam (Marshall et al. 1995).

The role of Ford Hatchery in the plan was to produce rainbow trout for stocking into Lake Roosevelt and Banks Lake. BOR annual project histories (BOR 1939-1947) and internal Ford planting records indicate that this, in fact, occurred. However, within 2-3 years Ford production

was subsequently shifted, with the concurrence of BOR, to resident trout to support the inland lakes put-and-take trout program because fishing pressure at Banks Lake and Lake Roosevelt was relatively low (BOR 1941-1947). The relationship between Ford Hatchery, which is operated by WDFW or predecessor agencies, to the federal anadromous fish facilities operated by USFWS, is an interesting one. Although all these facilities mitigate for fish losses caused by Grand Coulee Dam, the federal facilities have received O & M funding continuously since the time they were first put into service, whereas the Ford Hatchery has not received any O & M funding since it began producing fish in 1941. Thus, in effect, offsite mitigation has been subsidized at the expense of onsite mitigation in the vicinity of where the principal fish losses actually occurred, i.e., above Grand Coulee. This proposal seeks to partially redress this issue and restore balance to onsite-v-offsite compensation by requiring BPA to cost share a portion of the Ford Hatchery O & M with WDFW. Currently, Ford Hatchery O & M has totaled $194,117 annually during the past biennium.

This proposal seeks recovery of $66,677 of these O & M costs from BPA. (The cost totals $77,125 to BPA after application of a 20% WDFW indirect cost rate.) WDFW would then divert a portion of the production of the Ford Hatchery to Banks Lake and Lake Roosevelt kokanee but still maintain the inland lakes resident trout program. Additional expenditures totaling $16,354 are also requested from BPA to mark a portion of the proposed kokanee production and $40,872 to conduct a creel survey at Banks Lake. These last two items are for the purpose of monitoring and evaluating Ford kokanee production. WDFW will also donate time to evaluate Ford production of resident trout in Region 1 lakes and the Lake Roosevelt Monitoring Program (currently funded by BPA) will monitor and evaluate Ford kokanee production in Lake Roosevelt.

Section C describes the rationale for why kokanee are needed for Lake Roosevelt and Banks Lake. Both Banks Lake and Lake Roosevelt have sufficient zooplankton prey base to accommodate the increased kokanee production (Jagielo 1984; Beckman et al. 1985; Scholz et al. 1986; Peone et al. 1990). Ten years of intensive zooplankton and fish food habits monitoring in Lake Roosevelt by the LRMP - 1988 to 1998 - indicate that Mysis are absent (Peone et al. 1990; Cichosz et al. 1997).

Resident trout from Ford Hatchery are stocked primarily in lowland lakes in Region 1 (eastern Washington) that are managed as put-and-take trout fisheries under the WDFW's Lake Rehabilitation Program. The majority of these lakes are seepage lakes with no permanent inlet or outlet, and did no historically contain trout. Moreover, the original native species composition of these lakes were altered by introduction of exotics (such as carp, bass, minnows and sunfish) by the U.S. Fish Commission during 1880-1900. The commission transported them to the region in a specially constructed aquarium railroad car, then transferred them by milk containers placed on horse-drawn buckboard wagons to several lakes in the region (Lampman 1941). Gradually, the lakes became overrun with the exotic species. During the 1940s and 1950s most of these lakes were treated with rotenone and stocked with trout under the Lake Rehabilitation Program developed by the former Washington Department of Game (reviewed by Bradbury 1986). Most of these lakes have since been managed as put-and-take trout fishing lakes, with many of them continuing to receive periodic rotenone treatments (Bradbury 1986). Thus, continued stocking of trout into these water bodies probably has little impact on native species.

Focusing angler attention on these managed trout waters may provide benefits to the remaining native salmonids that occupy stream habitats in the region by reducing fishing pressure on the wild native stocks. Creel records (WDFW, file data) at the WDFW Region 1 office in Spokane, WA indicate that prior to the Lake Rehabilitation Program, the put-and-take trout lakes received relatively little angler pressure. Instead, during the 1930s and 40s anglers primarily fished for trout in streams. Washington Department of Game creel checks recorded hundreds of anglers annually in each of many streams in the area. As the inland lake trout stocking program gained momentum in the 1950s and 1960s, angler pressure shifted away from the streams to the lakes (WDFW, file data). By the late 1060s and early 1970s, angler pressure in streams declined to a fraction of the 1940s pressure, with approximately same creel survey effort applied during each time period. In some cases, streams that had 400 anglers checked in 10 days in the 1940s only had 10 anglers checked in 10 days in the late 1960s and 1970s.

In 1988, the Washington Department of Wildlife randomly surveyed 7,530 of the 530,000 licensed resident fish anglers in Washington State (Mongillo and Hahn 1988). Expansion of the survey results indicated total angler pressure was 14.7 million trips, with 76.2% of these trips (11.2 million) spent pursuing salmonids, including 4.7 million trips in lowland lakes, 2.9 million for steelhead, 1.7 million for stream dwelling trout and 1.2 million for cutthroat trout and dolly varden in coastal streams. In Region 1, 67% of the total days fished were in lowland lakes managed for trout whereas 23% were in trout streams and 10% were in the region's high lakes. Therefor, managing certain lakes as trout fisheries may provide substantial benefits to native fish in native habitats.

b. Rationale and significance to Regional Programs

The Ford Hatchery is specifically included as a Resident Fish Substitution program measure in NPPC's September 13, 1995 fish and Wildlife Program (Measure 10.8B.24). In 1987, NPPC adopted the Resident Fish Substitution Policy (1987 FWP, Section 207, p. 49), which was carried forward in both the 1984 and (most recent) September 13, 1995 (Section 10.8A, p. 10-29 to 10-30) version of the FWP.

The Council's Resident Fish Substitution Policy (1987 FWP, Section 207, p. 49-50) stated that salmon and steelhead will probably never be able to return to some areas of the basin because of blockages caused by dams, particularly above Grand Coulee (Columbia River) and Hells Canyon (Snake River). Grand Coulee Dam blocked salmon and steelhead from over 1,140 linear miles of habitat in the Columbia mainstem and principal tributaries above the Grand Coulee Dam (Craig and Hocker 1940; Bryant and Parkhurst 1950; Fulton 1968; Scholz et al. 1985). The Council concluded that: (1) Mitigation in blocked areas is appropriate where salmon and steelhead were affected by the development and operation of hydroelectric projects, and (2) To treat the Columbia River and its tributaries as a system, some level of substitution is reasonable in areas where in-kind mitigation cannot occur. In the September 13, 1995 FWP (Section 10.8A, p. 10-29 to 10-30), NPPC reiterated its commitment to the Resident Fish Substitution Policy, stating further that the policy "reflects the Council's resolve to address complex, long-term problems" in the blocked areas, especially as relates to concerns of the tribes residing in those areas. The NPPC further stated, "substitutions are one of the two highest priorities in the resident fish program..." and "The Council has determined that on-the-ground measures are achieved and the

level of rebuilding known, this priority is the best biological approach."

The biological basis for the Council's Resident Fish Substitution Policy centered around the following rationale: The economic cost to restore salmon above Grand Coulee would be cost prohibitive. (See discussion in Upper Columbia River Blocked Area Management Plan.)

Many of the genetic stocks of anadromous salmon that migrated above Grand Coulee are thought to have been extirpated. Habitat in the Columbia mainstem and principle tributaries in the blocked area above Grand Coulee has been altered by inundation to the extent that it can no longer support native fish in native habitats. This is true of adfluvial native resident fish as well as anadromous salmon. In some cases, hatchery production must be utilized in place of wild fish owing to operating restrictions in the reservoir. For example, Grand Coulee Dam generates approximately 25% of all the energy in the Pacific Northwest. Water stored in and released from its reservoir (Lake Roosevelt) provides for firm power generation at ten hydroelectric dams located below it. Section 4.(h)(5) of the Power Act requires that measures included in the FWP shall be consistent with "assuring the Pacific Northwest an adequate, efficient, economic and reliable power supply." Grand Coulee is also a flood control project. In recent years, flood control responsibilities in several reservoirs in the Snake River (Dworshak, Brownlee) have been transferred to Lake Roosevelt. This allows the Snake River reservoirs to remain full at a time they would normally be drafted to provide volume for catching spring runoff. The retained water is then released coinciding with the smolt migration to provide improved passage of endangered Snake River salmon. In Lake Roosevelt, the effect is to lower the reservoir lower than it was formerly lowered, which negatively impacts resident fish. Because of its central role in hydroelectric power production, it seemed unfeasible that we could place substantive operating restrictions to benefit natural reproduction by wild spawning resident fish without also affecting power production or flood control or recovery of ESA listed stocks. For example, prior to construction of a third power house at Grand Coulee in about 1970, historical records indicate that Lake Roosevelt supported large numbers of kokanee salmon that spawned along the shoreline (Stober et al. 1977, 1981; Scholz et al. 1986). During this period the average winter drawdown was about 30 feet. After the third powerhouse was constructed, winter drafts increased, typically to about 50-60 feet. This additional drafting reduced kokanee reproductive success and eventually caused the population to collapse (Stober et al. 1977, 1981; Scholz et al. 1986). Kokanee mortality occurred, because adult spawners constructed redds in lakeshore gravel in the fall. Before fertilized eggs hatched and emerged, the reservoir was drawn down, leaving them to desiccate in air. Kokanee prey, large zooplankton such as a variety of different species of Daphnia, were abundant in the reservoir probably owing to the ecological niche occupied by planktivorous fish being vacant (Jagielo 1984). One way to restore kokanee to the system would have been to limit the drawdown to 30 feet or less. There are three problems with this approach. First, it would have potentially reduced power production at Grand Coulee at a time (winter) when the region needed it and would thus be inconsistent with provision 4.(h)(5) of the Power Act. Second, it would require alteration of the Flood Control Rule Curve at Grand Coulee, either reducing system flood control by a large volume or more likely cause Grand Coulee Reservoir flood control to be shifted to a different storage reservoir, thereby complicating life for biological components in that system. Third, it could potentially have impacts on the recovery of endangered salmon since it would not be possible to shift the system flood control

from the Snake River reservoirs to Grand Coulee. Alternatively, kokanee could be raised in a fish hatchery during the period of drawdown and stocked as the reservoir was raising in early summer, a period that coincides with increasing prey abundance in the reservoir. This would make kokanee production relatively independent of reservoir operation and reduce conflicts with power production, flood control and anadromous fish recovery. It would probably be the least cost alternative because improving habitat for wild spawners would likely cost millions of dollars per year in foregoing power revenue at Grand Coulee and reduce firm loads at the ten downstream dams. The Council was aware of these types of arguments when it drafted the Resident Fish Substitution language in a way to allow flexibility for hatchery production. With the decline in salmon fishing, fishing pressure east of the Cascades has increased, dramatically in Lake Roosevelt where fishing pressure increased from 80,000 angler trips per year in 1980-1982 (Beckman et al. 1985) to a range of 232,000-595,000 angler trips per year from 1992 to 1995 (Cichosz et al. 1997). The Council note (Section 10.1, p. 10-2, 1995 FWP), that "it is the Council's expectation that these fisheries shall be enhanced to allow for consumptive subsistence and recreational fisheries for the region's Indian Tribes as well as consumptive and non-consumptive recreational fisheries for sport anglers. The Council recognizes that fishing pressure on inland fish of the Columbia River has increased appreciably since curtailment of ocean salmon fishing seasons." The Council's clear intent was that resident fish substitution should be accorded equal priority to rebuild weak but recoverable wild stocks of native fish. In the findings of the 1995 FWP, NPPC stated, "The Council's clear intent is that resident fish substitution activities also be funded. If the results of the Council's priority language is the funding of rebuilding efforts for weak but recoverable native fish populations and not of substitution measures (or vice versa), the Council will take action to address this situation (p.16-72)" and "The Council has no interest in a program that does nothing more than simply protect native fish populations from extinction at a non-fishable level, to the exclusion of developing thriving fisheries by substitution (p. 16-74)."

In the 1995 FWP, NPPC adopted several recommendations, proposed collectively by WDFW, UCUT Tribes and Colville Tribes, as Resident Fish Substitution measures (Measure 10.4B to 10.4B.5 and 10.8B to 10.8B.26). The proposed measures were credited against the blockage caused by Grand Coulee Dam and redress approximately 10-13 percent (i.e., partial mitigation) of the total losses of anadromous fish previously harvested by the tribes above the block at Chief Joseph and Grand Coulee Dams (see pages 10-30 of 1995 FWP). In the 1995 FWP Findings (page 16-164), NPPC concluded, "These provision complement the collective existing and future activities of the state and tribal fish agencies with management jurisdiction in the blocked area above Grand Coulee Dam. For this reason, deletion of any of these measures would not be consistent with Section 4.(h)(6)(A) of the Power Act. They are based on the best available scientific knowledge, as required by Section 4.(h)(6)(B) and they are the least cost alternatives consistent with Section 4.(h)(6)(C)."

Measure 10.8B (p. 10-40) states, in part, that the "biological objective for Ford Hatchery is production of 35,000 pounds of resident salmonids for planting in northeast Washington lakes and streams" and that the strategies for achieving biological objectives at the Ford Hatchery is to "improve water supply at Ford Hatchery to rear an additional 35,000 lb. of resident trout [and kokanee] and provide operation and maintenance expenses to rear these fish." NPPC further directed Boneville Power Administration to fund the Ford Hatchery measure. Specifically (Section 10.8B.24), "Improve the water supply at Ford Hatchery to rear 35,000 pounds of

resident trout and kokanee for stocking into Banks Lake and other northeast Washington lakes. Fund operation and maintenance costs for rearing these fish,"

c. Relationships to other projects

Principle relationships to other projects include:
Spokane Tribal Kokanee and Rainbow Trout Hatchery, WDFW Sherman Creek Kokanee and Trout Hatchery, and Kokanee net pens (FWP Measures 10.8B.2, 10.8B.4; BPA projects 9104700, 9500900, and 5228100). Collectively, the goal of these measures is to: (1) Produce 1 million age 1+ residualized kokanee salmon smolts for stocking into Lake Roosevelt (500,000 to be released directly from the hatchery into the lake and 500,000 to be released into net pens at age 0+ and raised in them until age 1+ before released into the lake); (2) Produce 500,000 age 0+ rainbow trout for the net pen program (FWP Measure 10.8B.11); and (3) Produce kokanee fry for stocking into Banks Lake (see January 1994 FWP, Measure 10.8B.5). The Spokane Tribal Hatchery and the Sherman Creek Hatchery are coordinated, with the tribal hatchery acting as the production facility and the Sherman Creek Hatchery acting as an imprinting and egg collection site.

The Spokane Tribal Hatchery and Sherman Creek Hatchery were originally designed to raise and release 6.75 million kokanee fry (Lake Whatcom stock) for Lake Roosevelt and 5 million fry for Banks Lake. However, preliminary coded wire tagging (CWT) investigations revealed that fry (age 0+) released into Lake Roosevelt resulted in poor returns to stocking sites as compared to yearling (age 1+) releases (Tilson et al. 1994). At the same time as preliminary CWT investigation was conducted, the fish collection facility at Rock Island Dam observed kokanee from Lake Roosevelt (Fielder 1997). It was hypothesized that kokanee may smolt at age 1+, including an increased tendency to migrate downstream. Thus, fish stocked at age 0+ would smolt in the reservoir, increasing entrainment through Grand Coulee Dam as compared to fish released at age 1+, which were stocked in late June or July. Although the release timing was set to coincide with peak prey (zooplankton) abundance, it was also fortuitous because they may have been released as residualized smolts that had lost their tendency to migrate. Tilson et al. (1994) investigated smolt behavior in Lake Whatcom stock kokanee and found that they exhibited many smolt transitions, including development of salinity tolerance, silvering and increased downstream migratory activity, from March to early June at age 1+ but began to residualize by mid June. From 1992 to 1994, 375,780 age 0+ fry and 211,654 age 1+ residualized smolts with CWT were released into Lake Roosevelt. Of these, 4 of the fish released at age 0+ compared to 427 of the fish released at age 1+ were later recovered as 2 or 3 year old spawners in Lake Roosevelt (Tilson et al. 1996, Tilson and Scholz 1997). Based on these results, hatchery production shifted from producing fry to producing 1 million residualized smolts for Lake Roosevelt, plus fry for Banks Lake and 500,000 rainbow trout for Lake Roosevelt net pens. This change was reflected in the 1995 FWP (Section 10.8B). However, there is currently both a water supply and space problem at these hatcheries. They are not able to raise the number of fish to meet the biological objective. In 1997, the Spokane Tribal Hatchery produced 500,000 kokanee (age 1+), 350,000 kokanee (age 0+), and about 530,000 rainbow trout (age 0+), which was the maximum the water supply could produce. To alleviate some of the space and water requirement problems at the Spokane Tribal Hatchery and Sherman Creek Hatchery, this proposal would shift a portion of the Lake Roosevelt and Banks Lake production to the Ford Hatchery. This would

occur by improving the water supply at Ford to accommodate additional production.

Lake Roosevelt Monitoring Program (LRMP) (FWP Measure 10.8B.5, Project #9404300). This program has two primary objectives: (1) Monitor and evaluate Lake Roosevelt biota to assess the effectiveness of FWP Measures 10.8B.2 to 10.8B.3 (STOI and WDFW Lake Roosevelt kokanee and rainbow trout hatcheries), 10.8B.4 (Lake Roosevelt kokanee net pens), 10.8B.9 (Habitat improvement projects in Lake Roosevelt tributary streams for production of wild rainbow trout), 10.8B.11 (Rainbow trout net pens program for Lake Roosevelt) and 10.3E.3 to 10.3E.5 (Operation guidelines for Lake Roosevelt to protect resident fish); and (2) Determine impacts of reservoir operation on achieving the biological objective addressed by these measures. Data from this project will be used to model Lake Roosevelt for the purpose of developing (a) biological rule curves to protect the resident fishery, and (b) integrated rule curves that will combine rule curves for flood control, power production, irrigation and downstream anadromous fish needs, with the biological rule curve for Lake Roosevelt resident fish, to balance the needs of all these multiple uses of Lake Roosevelt water. Additionally, LRMP monitors the impacts of stocking hatchery fish on the ecology of Lake Roosevelt. Pages 10-41 to 10-43 of the September 1995 FWP describes specific components of the LRMP in detail. We propose that LRMP will evaluate kokanee produced by Ford Hatchery that are stocked into Lake Roosevelt, including: (1) Contribution to creel; (2) Return to stocking sites for egg collection; and (3) Impact on the ecology of Lake Roosevelt. Since LRMP is already monitoring these parameters, no additional cost will be incurred to evaluate the Ford Hatchery kokanee. Thus, having the LRMP evaluate the Ford Hatchery kokanee production will be the least cost to hydroelectric ratepayers.

Chief Joseph/Grand Coulee Kokanee Enhancement Project. Evaluate natural production of kokanee above Chief Joseph/Grand Coulee Dams (FWP Measure 10.8B.7, BPA Project # 950110). The purpose of this measure is to evaluate the status of natural producing kokanee in Rufus Woods Reservoir and Lake Roosevelt, determine what measures are necessary to ensure self-sustaining populations, and determine the feasibility of using these fish for the kokanee hatchery program since they seem to be able to remain in the system untill they reproduce. As part of this project, hydroacoustic surveys combined with gillnet surveys in the forebay are being conducted to assess entrainment over Grand Coulee Dam (FWP Measure 10.8B.8). Project may identify kokanee stocks that may be better suited to Lake Roosevelt. If so, these fish may be substituted for the Lake Whatcom stock kokanee currently used for hatchery production.

d. Project history (for ongoing projects)

Not applicable. New project.

e. Proposal objectives

Improve water supply and hatchery building at Ford Hatchery to restore 35,000 lb. of kokanee and resident trout by increasing production from 58,000 lb. to 93,000 lb. annually.
Potential benefits include:

Increased flow from hatchery water source.

Improved water quality by reducing sedimentation.
Increased capability to produce more lb. of fish.
Improved fish health resulting from increased flow and better water quality.

Operate and maintain Ford Hatchery to produce 93,000 lb. of kokanee and resident trout annually for stocking into Lake Roosevelt, Banks Lake and put-and-take trout fishing lakes in northeastern Washington. Production will include:

1.5 million kokanee (@ 200/lb.) stocked into Banks Lake, 7,500 lb.
0.25 million kokanee (@80/lb.) stocked into Banks Lake net pens = 3,125 lb. (all marked with adipose fin clip).
0.25 million kokanee (@ 80/lb.) stocked into Lake Roosevelt net pens = 3,125 lb. (all marked with fin clip combination that distinguishes them from other Lake Roosevelt kokanee)
83,000 lb. of resident trout stocked into lakes managed as put-and-take trout lakes in Region 1.

Coordinate Ford Hatchery operations with those at WDFW Sherman Creek Hatchery and Spokane Tribal Hatchery to meet production goals for kokanee in Lake Roosevelt and Banks Lake.

Monitor and evaluate improvements in the kokanee fisahery at Lake Roosevelt and resident trout fishery in inland put-and-take lakes resulting from Ford Hatchery stocking.

Monitor and evaluate improvements in the kokanee fishery in Banks Lake resulting from Ford stocking.

f. Methods

Objective 1 Methods

WDFW will conduct engineering and design to restore and improve the Ford Hatchery water supply and remodel the Ford Hatchery building in house using their engineering/construction staff.

WDFW, in collaboration with BPA will conduct a NEPA assessment and identify permits that will be required for the project.

WDFW will obtain the required permits for the project.

WDFW will direct rebuilding the ground water infiltration system as identified in the planning phase (Task 1a above). Improvements may include: (I) installation of subterranean tiles at springs to collect more water by stopping seepage back into the ground, and (II) enclosure of water currently flowing through open infiltration trenches that are currently experiencing erosion and contributing to sedimentation problems.

WDFW will direct demolition of the old building shell, taking care not to damage the existing foundation or permanent concrete raceways. Portable elements of the water supply and

incubation system will be removed prior to demolition. WDFW will direct the construction of the replacement shell.

Objective 2 Methods

Develop a Memorandum of Agreement between BPA and WDFW to partially fund operation and maintenance of Ford Hatchery for an initial period of 10 years. The parties will also develop an annual operating plan (AOP) with annual production goals (APG), and identify the portion of Ford Hatchery production that will be credited to hydroelectric ratepayers.

Incubate, hatch and rear 1.5 million kokanee to a release size of 200/lb. and 250,000 to a release size of 80/lb. for stocking in Banks Lake and Banks Lake net pens (6,875 lb.). Fish incubation and rearing procedures will follow standard WDFW practices.

Incubate hatch and rear 250,000 kokanee to a release size of 80/lb. for transfer to Lake Roosevelt net pens (3,125 lb.). Fish incubation and rearing procedures will follow standard WDFW practices.

Incubate, hatch and rear 83,000 lb. of resident trout for stocking into put-and-take trout fishing lakes in eastern Washington. Fish incubation and rearing procedures will follow standard WDFW practices.

Transfer and release 10,625 lb. of kokanee into Banks Lake and Banks Lake net pens. Fish hauling procedures will follow standard WDFW practices.

Transfer and release 3,125 lb. of kokanee into Lake Roosevelt net pens. Fish hauling procedures will follow standard WDFW practices.

Transfer and release 79,250 lb. of resident trout into put-and-take trout fishing lakes in eastern Washington. Fish hauling procedures will follow standard WDFW practices.

Fin clip kokanee before release into Banks Lake or Lake Roosevelt. All kokanee (250,000) released into Lake Roosevelt net pens will be fin clipped with an adipose clip plus another clip to differentiate them from all other kokanee stocked in the lake. WDFW policy requires that all hatchery kokanee put into Lake Roosevelt be marked to differentiate them from wild fish. WDFW currently has a regulation that permits anglers to harvest only adipose clipped (hatchery) fish in order to protect wild stocks. Kokanee put into Banks Lake will net pens (250,000 fish) will also be clipped. Fin clipped fish will enable determination of contribution to the creel and exploitation rate of stocked fish.

Monitor fish health at Ford Hatchery. Ford is currently monitored by WDFW pathologist to see that it conforms to WDFW fish health policy and guidelines.

Record keeping and communication. At the beginning of the production year, the hatchery personnel will write an Annual Operation Plan (AOP) to BPA that identifies Annual Production Goals (APG). At the end of the year, hatchery personnel will write an annual report to BPA that

describes attainment of the APG and assesses effectiveness of the stocking program in terms of creel harvest. The hatchery will also keep routine records maintained by WDFW, e.g. hatching success, food conversion, disease monitoring, and planting records.

Objective 3 Methods

Attend quarterly meetings of the Lake Roosevelt Hatchery Coordination Team. Interact with Sherman Creek and Spokane Tribal Hatchery managers to coordinate production and outplanting.

Objective 4 Methods

The Lake Roosevelt Monitoring Program (LRMP) will monitor harvest rates and return to stocking sites of kokanee transferred from Ford Hatchery to Lake Roosevelt net pens. No additional cost to BPA will have been incurred because the LRMP is already collecting these data. Results will be reported in the LRMP annual report to BPA.

WDFW will conduct creel and fish surveys at inland put-and-take trout fishery lakes as part of routine monitoring at these lakes at no cost to BPA. This is shown as a cost sharing item by WDFW on the budget page. Each year two lakes stocked by Ford Hatchery will be identified and two regional fisheries biologists in Region 1 will each spend approximately 10% of their time to evaluate stocking success by conducting creel survey and fisheries surveys on the identified lakes. The fisheries biologists will develop a report to be sent to Ford Hatchery for inclusion in the Ford Hatchery Annual Report to BPA.

Objective 5 Methods

WDFW personnel (Ephrata office) will design a stratified (weekday - v - weekend/holidays) random sampling creel survey for Banks Lake using standard procedures (Malvestuto 1983).

Creel surveys will be conducted on 8 randomly selected weekdays, on 4 randomly selected weekend/holidays each month. On each day, replicate pressure counts by automobile will be made to count boat trailers and shore anglers to estimate mean fishing pressure by each group. The aim is to estimate mean pressure and variance (to calculate 95% confidence intervals) by strata and angler type during each month.

Confirm pressure counts by making air flights twice per quarter, once on a weekend and once on a weekday.

Each day make access point survey at randomly selected angler site. Conduct angler interviews of boat and shore anglers to determine:

- Length of completed fishing trip.
- Catch (including catch-and-released fish) and harvest of individual species.
- Individual fish data (species, sex, length, weight, fin clip).
- Residence of angler.
- Number in party.

In office, complete and tabulate statistical data to determine:

Average fishing pressure for each strata by angler type.
Average CPUE (catch-per-unit-effort) for each strata by angler type.
Average HPUE (harvest-per-unit-effort) for each strata by angler type.
Other information.

Then expand creel data by strata and add the final numbers for all strata to estimate:

Total monthly pressure (95% CI).
Total monthly catch (including released fish) (95% CI).
Total monthly harvest (95% CI).

Combine the total monthly value to provide:

Total annual pressure (95% CI).
Total annual catch (95% CI).
Total annual harvest (95% CI).

Use expanded creel data to estimate the number of annual angler trips and economic value of the fishery to the region. Economic value will be estimated by applying USFWS data on average cost of an angler trip to numbers of angler trips.

Write annual report that summarizes total angler pressure, CPUE, HPUE, total catch, total harvest and economic value of the fishery. This report will be provided to Ford Hatchery for inclusion in BPA annual report.

g. Facilities and equipment

Facilities include an operating fish hatchery with natural spring water supply. The Ford Hatchery building contains 96 incubation and rearing troughs. Incubation is in baskets. Fry and fingerling trout and kokanee are reared in the indoor incubation troughs and ten 30' x 4' x 1.5' indoor raceways. Yearling and broodstock trout are reared in twelve outdoor circular concrete tanks (40' diameter), eight outdoor rectangular concrete raceways (100' x 12' x 2') and four wood raceways (50' x 10' x 1.5'). A pollution abatement system/settling pond was added in 1980 in compliance with Washington SEPA codes.

Support facilities include three residences, a small office and feed storage rooms (one chilled) in the hatchery building, and a three bay garage which is also used as a shop and for storage. The present alarm system monitors the head box at the collection/diversion pond and the head box in the hatchery building.

WDFW maintains hatchery trucks, which can be utilized for hauling kokanee for this project on a cost/reimbursement per trip basis.

WDFW maintains a strict disease control management plan for its hatchery facilities.

h. Budget

Budget is justified for BPA portion of both FY 2000 and outyear costs from 2001 to 2004 as indicated below:

Personnel and Fringe Benefits

Personnel costs include:
One fish Culturist (1 FTE: 12 mo. @ 2686/mo. = $32,232 + fringe benefits) to assist with routine care of fish and hatchery maintenance (the main portion of this proposal).

Three Scientific Technician 1 positions [3 positions X 0.166 FTE (2 mo.) X $174/mo. = $10,446 + fringe benefits to fin clip kokanee salmon put into Lake Roosevelt and Banks Lake. This allows for a current regulation in Lake Roosevelt where anglers in Lake Roosevelt are allowed to keep only fin clipped kokanee. This protects wild fish from harvest. Clipping a portion of the Banks Lake kokanee allows us to determine the proportion of hatchery to wild fish in the creel and estimate exploitation rate of stocked fish. Assuming that one person fin clips 3,000 per day and there are 43 weekdays in two months, the fin clippers should be able to mark 250,000 fish for Lake Roosevelt and 250,000 for Banks Lake.

One Scientific Technician 1 (1 FTE: 12 mo. @ $1741/mo. = $20,000 + fringe benefits) to conduct creel surveys at Banks Lake. Last year the ISRP commented on project proposals indicating that common mistakes with implementation projects was the forgotten requirement of monitoring and evaluation. This position addresses that ISRP concern. A full time creel clerk is needed for this project because to get adequate information to produce 95% confidence intervals on a water body the size of Banks Lake will require that surveys be accomplished on 8 weekdays and 4 weekend/holidays per month. Data entry, expansion and report writing will occupy the remainder of time. Since Banks Lake is a year round fishing lake, surveys will have to be conducted year round at least during the initial year of the survey. Fringe benefits is the current Washington State fringe benefit applied to employees of state agencies.

Supplies

Supplies are needed for conducting the creel survey, including fish measuring board, balance or spring scale, coin envelopes for scale samples, write-in-rain waterproof paper for data forms, pens and pencils, and diskettes for entering data collected onto computer data bases. Fin clippers are needed to clip fins of 500,000 kokanee released into Lake Roosevelt and Banks Lake.

Operation and Maintenance

Fish food costs for rearing 1.5 million kokanee to a fry release size of 200/lb. And 0.5 million kokanee to a fry release size of 80/lb. were estimated by assuming that fish would be fed different size od Bioproducts semi-moist feed (average price $1.05/lb.) and applying conversion rates (Piper et al. 1984), resulting in a total of $13,750 lb. of food at an average price of $1.05/lb. = $14,437 in total food cost. The Bioproducts feed was recommended by WDFW fish pathologist Steve Roberts as the best available in order to maintain fish health.

Fish health monitoring costs include routine checks and testing by a WDFW fish pathologist and

chemicals for treatment of bacterial infections.

Capital Improvement, Construction-Related Support And NEPA Costs.

Capital improvements are not slated to begin until FY 2001. They are briefly discussed here for two reasons: (1) Some cost estimates in FY 2000 were dependent upon these projections because they are budgeted as a percentage of those costs; and (2) The capital improvements estimates were used to forecast outyear costs.

The cost of improving the hatchery water supply was estimated by WDFW engineers at $200,000 in 1995 (Zook 1995). The Consumer Price Index (CPI) was applied to this estimate to calculate inflation between 1995 and October 1998 (8.9%), yeilding $217,800 in 1998 dollars.
The cost of demolition of the old hatchery building was estimated by Neil Turner, WDFW construction supervisor at $50,000.

The cost of restoring the hatchery building shell was estimated by consulting the section on theoretical hatcheries in Senn et al. (1984). This reference estimated costs associated with constructing three different salmonid hatcheries. The mean price to construct one per square foot of building was $95. The cost was for the building shell only, not appurtenant structure such as raceways. This figure was multiplied by the square footage of Ford Hatchery (4,000 sq. ft.) to yield a cost of $380,000 (in 1984 dollars). The CPI was applied to this value to calculate inflation between 1984 and October 1998 (60.6%). The inflation cost ($230,280) was added to the 1984 estimate to yield current cost of $610,000.

Engineering design was estimated at 10% of total capital value ($828,080) for these upgrades (i.e., $82,808). Engineering design will be accomplished by WDFW engineers. NEPA permitting was estimated by Patti Smith (BPA) at $100,000.

Travel

Transportation cost to haul kokanee from Ford Hatchery to Banks Lake and Lake Roosevelt were based on standard WDFW rates of $1.42/mile to operate hatchery trucks and $16.57/hour for the driver. It was assumed the hatchery truck could haul 500 lb. of fish per trip, so:

1,500,000 fish stocked into Banks Lake @ 200/lb. = 7,500 lb. of fish/500 lb. of fish per trip = 15 trips to Banks Lake; 250,000 fish stocked into Banks Lake @ 80/lb. = 3,125 lb. of fish/500 lb. of fish per trip = 6 more trips to Banks Lake (total 21 trips to Banks Lake); 250,000 fish stocked into Lake Roosevelt net pens @ 80/lb. = 3,125 lb. of fish/500 lb. of fish per trip = 6 trips to Lake Roosevelt.

Costs were derived as follows:

Ford to Banks Lake (21 round trips x 200 miles RT x $1.42/mi.)+($16.57/hour for driver x 4 hours) = $350.28/trip = $7,356 for 21 trips.

Ford to Lake Roosevelt = (6 round trips x 150 miles RT x $1.42/mi.)+($16.57/hour for driver x 3

hours) = $1,576.

Banks Lake creel survey costs were estimated at 12 trips per month (4 weekend and 8 weekdays) or 144 trips per year. The creel clerk will be paid milage for his or her personal automobile after arriving at the lake. Daily driving to conduct creel survey after arrival was estimated at 90 miles. The Washington State reimbursement rate for using personal vehicles for state travel is currently $.315/mile, so 144 days X 90 miles X $.315/mile = $4,082.

Air flight cost $145/hour. Flight time round trip from the nearest airport is about two hours X 8 flights/year = $2,320.

Indirect Cost

Current WDFW/federally negotiated rate for indirect cost is 20% of total contract less fish feed and capital construction costs. This is the rate we applied.

Outyear Costs

Annual hatchery operation and maintenance costs - including salaries and fringe benefits for the fish culturist and fin clipping crew ($54,457), fish food and fish health monitoring ($16,437), transportation costs to stock kokanee in Banks Lake and Lake Roosevelt ($8,932) and indirect cost ($13,078) - totaled $92,904. This amount was used to project outyear costs of hatchery operation from FY 2001 to FY 2004.

Monitoring and Evaluation Cost: Annual creel survey cost including salary and fringe benefits for the creel clerk ($26,658), milage ($4,082), air flights ($2,320), supplies ($500) and indirect costs ($6,712) totaled $40,202. This cost was used to project outyear costs of monitoring and evaluation of kokanee stocking at Banks Lake from FY 2001 to FY 2004.

Capital Improvement Costs: Outyear costs of capital improvements justified above were estimated at $217,800 (1998 dollars) in FY 2001 for water supply and $660,280 (1998 dollars) in FY 2002 for demolishing the old hatchery building shell and replacing it with a new one. All these costs were adjusted for current rate of inflation (1.3% November 1997 to October 1998) using the Consumer Price Index as shown below:

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Hatchery O&M	$92,904	$94,111	$95,334	$96,573	$97,828
M&E costs	$40,272	$40,795	$41,325	$41,865	$42,409
Capital Improvement	NA	$220,631	$677,558	$0	$0
Total Outyear Budget	$133,176	$355,537	$814,247	$138,438	$140,237

Section 9. Key personnel

Mike Lewis, Complex Manager, Washington Department of Fish and Wildlife (1/4 FTE).

Project Duties: Oversight of operation and maintenance of four WDFW hatcheries at Spokane, Ford, Colville and Sherman Creek. Track budget at each facility, supervise field staff of 10 employees. Work closely with regional staff and area biologists to make sure regional production goals are met. Key liaison between Olympia and field personnel to ensure business is conducted following WDFW policy guidelines. Participate in hatchery activities such as spawn take. Participate in various regional coordination committees such as the Lake Roosevelt Hatchery Coordination Team.

Employment Experience:

14 years with WDFW, 8 at manager and supervisory capacity.
Worked in four key watersheds in Washington State: Lower Snake River, Skagit River, Lake Washington and Lake Roosevelt/Spokane River.

Section 10. Information/technology transfer

Reporting requirements: Annual Operating Plan and Annual Report will be submitted to BPA annually. Hatchery statistical data such as hatching success and planting records are compiled on WDFW state data base. Monitoring and evaluation data collected for this project will be compiled on WDFW's Washington Angler Data Base. These data will also be supplied to the Joint Stock Assessment (JSA) Team composed of WDFW, Kalispel Tribe, Spokane Tribe and Colville Tribe that is compiling a regional resident fish data base for the blocked area above Grand Coulee Dam.

Congratulations!